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A COMPARISON OF A FALL AND WINTER APPLICATION OF CARBOFURAN FOR CONTROLLING SEED ORCHARD INSECTS ON SHORTLEAF PINES IN LOUISIANA

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A COMPARISON OF A FALL AND WINTER APPLICATION OF CARBOFURAN FOR CONTROLLING SEED ORCHARD INSECTS ON SHORTLEAF PINES IN LOUISIANA

by

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ABSTRACT

February and October treatments using carbofuran granules (10 percent) at the rate of 134 grams per cm d.b.h. (12 ounces per inch d.b.h.) were tested during 1975-76. Results from the test showed the October treatment statistically better than the check and statistically equal to the February treatment for protecting conelets from tip moth attack, for protecting cones from coneworm attack, for preventing empty seeds, and for protecting early season (June) tips from tip moth attack. The February treatment was statistically better than the October treatment for the unknown and unknown insect damage categories. Numerically, the October treatment was slightly better than the February treatment for protection of conelets, but the February treatment was better for protecting seeds. Further fall tests using the present registered rate of 45 to 90 grams (4 to 8 oz/in) of carbofuran per cm d.b.h. on other southern pines at different locations in the South should be conducted before a change in the registration label to include fall treatment is proposed.

INTRODUCTION

As a result of a series of tests conducted during 1974 and 1975, carbofuran (Furadan® 10G granular)[2/] [3/] was registered for controlling

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2/ Mention of commercial products in this paper does not constitute endorsement by the U.S. Department of Agriculture to the exclusion of other products that may be suitable.

3/ This report mentions evaluations involving insecticides. It does not contain recommendations for their use nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agency before they can be recommended.

coneworms, seedworms, and seedbugs in southern pine seed orchards (DeBarr 1978). All tests were applied in winter or early spring (December through March) at the rates of 45, 90, 180, or in some cases, 134 grams per cm of tree d.b.h. during the 2-year period. In most cases treatments gave season-long protection to seeds and cones. However, no fall treatments were applied and protection to conelets for specific causal agents was not assessed. A fall treatment, rather than a winter or early spring treatment, would have two advantages. One would be the less likelihood that rains would cause wet soil and prevent application equipment getting into the orchard. Another advantage would be protection to flowers during flower development in winter and early spring.

To determine if a fall treatment using carbofuran granules would be effective in protecting shortleaf pine conelets, cones, seeds and tips from insect depredation, an evaluation was conducted during October 1975 through October 1976 comparing October and February carbofuran applications.

METHODS

The evaluation was made on the Texas shortleaf geographical source at the Stuart Orchard, Louisiana. Trees were 8- to 10-years-old and averaged 15 cm (6") d.b.h. and 8 m (26') in height. Spacing was 4.3 x 8.6 m (15 x 30'). The area consisted of rolling hills and the soil was of the Bowie, Beauregard type with a yellowish brown silty loam texture and a pH of 5.0 - 6.5.

Two ramets of each of the four clones were given the following treatments: 1) 134 grams of carbofuran (10% granular) per cm d.b.h. (12 ounces per inch d.b.h.) applied in October 1975. 2) 134 grams of carbofuran (10% granular) per cm d.b.h. applied February 1976. 3) An untreated check. The carbofuran treatments were both 45 grams (4 oz) greater than the largest dosage now registered (90 grams). Carbofuran granules were applied by sprinkling premeasured quantities evenly from the trunk of the tree to the drip line and watering in granules by a hydraulic sprayer.

Twenty percent of the conelets and cones on the above ramets were tagged in February 1976 and examined at monthly intervals through October 1976. The condition and the agents causing damage were recorded for each structure on punch card data sheets designed for development of cone life tables (Fatzinger et al. 1975). In October 1976, five apparently sound cones were selected from each sample tree. Two extractions of seed from cones were made as follows: 1) all seed that would shake out by hand, and 2) remaining seeds dissected from cones. Each extraction of seeds was placed into individual envelopes, labeled according to treatment, clone, ramet, and extraction number,

and X-rayed. X-rays were interpreted and seed categorized as follows: sound, empty, seedbug damaged, seedworm damaged, and malformed. For the purpose of this evaluation, data from both extractions were combined.

Tip moth damage to tips was assessed by examining the topmost 20 tips on each sample tree and recording the damage in June and September 1976.

The evaluation was designed for a two-way analysis of variance (ANOV) and the experiment, a three-factor experiment in which two factors, treatments and clones, were crossed and the third factor, ramets, was nested in the clones. The response variables analyzed by analysis of variance were as follows: percent full seed, numbers of full seed per cone, percent damaged tips as of June 1976, percent damaged tips as of September 1976, percent conelet losses by coneworms, percent conelet loss by tip moths, percent conelet losses by other and unknown insects, percent conelets missing and aborted, percent cone losses by coneworm, percent cone losses from unknown causes, percent cones missing and aborted.

RESULTS

For tip moth damage to conelets, both February (0 percent) and October (2 percent) Furadan treatments were significantly less than the check (8 percent) at the 5 percent level of significance (table 1). There was no significant difference between the February and October treatments for this category. The February treatment (9 percent) was significantly better than both the October and check treatments (17 percent) for the unknown damage category at the 5 percent level of significance. For overall conelet losses, the October Furadan treatment was the best with 42 percent followed by the February treatment with 51 percent and the check with 54 percent; however, differences between these means were not significant.

For coneworm loss to second year cones, both the February (0 percent) and October (0 percent) Furadan treatment means were significantly less (5 percent level) than the check (5 percent)(table 2). As regards percent full seed and full seed per cone, both the February and October treatments were significantly better than the check. Numerically, the means for these two categories were larger for the February treatment than for the October treatment; however, there was no significant difference between October and February treatment means for either category.

For tip protection, both February (0 percent) and October (0 percent) treatments were significantly better than the check (10 percent) during the June 1976 examination (table 3). However, for the September 1976 examination, there was no significant difference between any of the treatments.

Table 1. Percent Conelet mortality, Furadan timing evaluation, Stuart Orchard, 1975-76.

Mortality Factor	Check	Furadan[1/] Feb. '76	Furadan[1/] Oct. '75
Tip moth	8a[2/]	2b	0b
Coneworm	0a	0a	0a
Unknown and unknown insect	17a	9b	12a
Missing and aborted	27a	32a	29a
Total losses	54a	51a	42a

1/ Applied by hand at the rate of 12 ounces per in d.b.h.

2/ Treatment means not followed by the same letter are significant at the 5 percent level of significance.

Table 2. Cone and seed damage, Furadan timing evaluation, Stuart Orchard, 1975-76.

Factor	Check	Furadan[1/] Feb. '76	Furadan[1/] Oct. '75
Percent coneworm	5a[2/]	0b	0b
Percent full seed	40a	73b	54b
Number of full seed/cone	23a	43b	31b

1/ Applied by hand at the rate of 12 ounces per inch d.b.h.

2/ Treatment means not followed by the same letter are significant at the 5 percent level of significance.

Table 3. Percent killed tips following carbofuran treatment in October 1975 and February 1976.

Month of Examination (1976)	Check	February[1/]	October[1/]
June	10b[2/]	0a	0a
Sept.	38a	29a	28a

[1/] 12 ounces of carbofuran per inch of tree d.b.h. applied by hand from the trunk to the dripline of the tree and watered in.

[2/] Treatment means not followed by the same letter were significantly different at the 1 percent level of significance.

SUMMARY AND DISCUSSION

During this evaluation, the October treatment, with 134 grams carbofuran/cm (12 oz/in) d.b.h., was statistically better than the check and statistically equal to the February treatment for protecting conelets from tip moth attack, for protecting cones from coneworm attack, for preventing empty seeds, and for protecting midseason (June) tips from tip moth attack. The February treatment was statistically better than the October treatment for the unknown and unknown insect damage categories.

Although data were not statistically significant, the October treatment was slightly better than the February treatment for protecting shortleaf pine conelets, but the February treatment was better for protecting seeds.

In a similar test in February 1975 on shortleaf pines at Stuart Orchard using carbofuran at the rates of 45, 90, and 134 gr/cm d.b.h. (4, 8, and 12 oz/in d.b.h.), numbers of sound seed per cone were increased by 17, 23, and 20 percent respectively over untreated checks. During the 1976 test, the number of sound seed per cone was increased by 20 for the February treatment and 8 for the October treatment. The number of full seed per cone for all treatments for 1975 averaged 18, while the February 1976 treatment averaged 43 and the October 1975 treatment averaged 31. The February 1976 treatment had as many full seeds per cone as the February 1975 treatment had in total (full + damaged) seed per cone. Other factors may have been involved in causing empty seeds; however, seedbug populations were very high at Stuart Orchard in 1975, thus causing considerable loss despite treatment.

Several tests using various rates of carbofuran on loblolly and slash pines during 1975 increased survival of conelets from 6 - 71 percent over check treatments. This compares with 3 percent increased survival for the February 1976 treatment and 12 percent increased survival for the October 1975 treatment.

Neither the October nor February treatment lasted the complete season for tip protection during this evaluation. However, the authors have found during previous tests that Furadan gave tip protection for an entire season (Overgaard et al. 1978). The reason for this inconsistency is not known.

Overall results from this evaluation indicate that a fall treatment of carbofuran granules is promising for protecting shortleaf pines from cone and seed insect damage. However, further tests during the fall using present registered rates of 45 to 90 grams per cm d.b.h. (4 to 8 ounces per inch d.b.h.) would have to be conducted

on different species of pines at different locations and soil types in the South before a registration label change to include a fall treatment could be proposed. Such tests should run at least 2 years in order to get treatment effects of carbofuran applied in the fall for protection of immature seeds from flower set until harvest.

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